

## SHEET METAL FASTENING CLIP

### RELATED APPLICATION

This application is a continuation-in-part of U.S. Patent Application  
Serial No. 10/603,017, filed June 24, 2003, which claims priority of U.S.  
5 Provisional Patent Application Serial No. 60/390,946 filed June 24, 2002.

### FIELD OF THE INVENTION

The present invention relates to mounting clips for securing fasteners to  
sheet metal and more particularly to a fastener mounting clip that can be  
inserted into a bore hole formed in sheet metal material.

### 10 BACKGROUND OF THE INVENTION

Sheet metal nuts or mounting clips are used in the automobile industry  
as well as in the household appliances industry for fastening trim work or other  
components to the sheet metal body. Many conventional sheet metal nuts are  
designed to be pushed onto the edge of a sheet material work-piece having a  
15 hole adjacent thereto until a hole of the sheet metal nut and the work-piece  
coincide.

However, many motor vehicle construction processes require that trim  
work or other components be fastened to the interior vehicle chassis, exterior  
body panels or other fastening points which do not lie at the edge of the sheet  
20 material or work-piece but in other areas of the work-piece surface, such as the  
middle. For this case, the present invention provides a sheet material mounting

clip that may be received into a bore hole formed in the sheet material and operative to be easily inserted while providing a substantial resistance to pull-out forces.

#### SUMMARY OF THE INVENTION

- 5           The present invention provides a fastener mounting clip for securing a fastener in a bore hole formed in sheet materials such as sheet metal or the like. The mounting clip is formed for easy insertion with low insertion forces and to provide high resistance to extraction forces. The fastener mounting clip includes a planar surface having an outside edge and a recessed aperture
- 10           formed central to the planar surface. The bore hole is operative to receive and retain a conventional fastener therein for securing various objects such as trim material to the sheet material. The bore hole has rectangular corners. Retaining arms are formed to engage the sheet metal at the rectangular corners of the hole to utilize the relative strength of the corners to resist extraction.
- 15           Two elongated guide arms are formed on the outside edge of the planar surface. The guide arms stand spaced apart in an opposing fashion and extend beneath the planar surface at an obtuse angle. The guide arms are operative to guide the mounting clip into the bore hole formed in the sheet material.
- 20           Two resilient retaining arms are also formed in opposing fashion on the outside edge of the planar surface. The arms stand spaced apart in an opposing fashion and also extend beneath the planar surface at an obtuse angle that is preferably equivalent to the obtuse angle of the guide arms. The retaining arms are operative to compress and expand upon insertion of the fastener mounting

clip into the bore hole formed in the sheet material. After insertion of the fastener mounting clip into the bore hole, the top sides of the expanded retaining arms abut against a surface of the sheet metal and provide resistance to pull-out forces. The corners of the sheet metal about the bore hole have a  
5 greater resistance to deformation than edges of the sheet metal between the corners. Thus, by engaging the sheet metal at the corners of the bore hole, the mounting clips provide greater extraction forces.

At least two support tabs extend outwardly from the outside edge of the planar surface preferably in opposing directions such that the two tabs would  
10 be spaced apart substantially at 180 degrees. The tabs are operative to abut against an opposing surface of the sheet metal relative to the surface in contact with the retaining arms after the fastener mounting clip has been fully inserted into a bore hole of the sheet metal. The tabs are operative to prevent the mounting clip from passing through the bore hole during insertion and to  
15 stabilize the mounting in the sheet material.

#### BRIEF DESCRIPTION OF THE DRAWINGS

A better understanding of the present invention will be had upon reference to the following detailed description when read in conjunction with the accompanying drawings in which like parts are given like reference  
20 numerals and wherein:

Figure 1 is a perspective view of the first preferred embodiment of the fastener mounting clip for sheet material;

Figure 2 is a cross-sectional view of the fastener mounting clip of Figure 1 of the first preferred embodiment of the invention;

Figure 3 is a side view of the fastener mounting clip illustrating the retaining arms as according to the first preferred embodiment of the invention;

5        Figure 4 is a side view of the fastener mounting clip illustrating the guide arms as according to the first preferred embodiment of the invention;

Figure 4A is a top view of the fastener mounting clip in position in a bore hole according to the first preferred embodiment of the invention;

10       Figure 5 is a perspective view of a first alternative preferred embodiment of the fastener mounting clip comprised of a two-piece assembly;

Figure 6 is a side view of the first alternative preferred embodiment of the fastener mounting clip assembly disposed in a bore hole formed in a piece of sheet material;

15       Figure 7 is an end view of the first alternative preferred embodiment of the fastener mounting clip assembly as according to the invention;

Figure 8 is a top view of the first alternative preferred embodiment of the fastener mounting clip assembly as according to the invention;

Figure 8A is a top view of the first alternative preferred embodiment of the clip shown in position in the bore hole of the sheet metal;

20       Figure 9 is a top view of a second alternative preferred embodiment of the invention;

Figure 10 is a side view of the second alternative preferred embodiment of the fastener;

Figure 11 is an end view of the second alternative preferred embodiment of the fastener mounting clip assembly;

Figure 12 is a perspective view of a third alternative preferred embodiment of the fastener mounting clip assembly taken from above;

5        Figure 13 is an exploded perspective view of the third preferred embodiment of the mounting clip;

Figure 14 is a side view of the third preferred embodiment of the mounting clip showing the clip in the environment; and

10        Figure 15 is a side view rotated 90 degrees from Figure 14 of the third preferred embodiment of the mounting clip.

#### DETAILED DESCRIPTION OF THE INVENTION

The present invention provides a novel fastening clip for use in providing a mounting for fasteners used to fasten objects to sheet material bodies having bore holes formed therein. The fastener mounting clips are  
15        operative to require low insertion force and to provide high retention force. Thus, the inventive fastener mounting clips are easily installed and mount securely to sheet materials having bore holes formed therein.

As shown in Figures 1-4, the preferred embodiment of a fastener mounting clip 10 is formed from a single sheet of metal 31 such as spring steel,  
20        aluminum, tin or copper for insertion into an aperture 32.

The fastener mounting clip 10 includes a planar surface 12 preferably formed in a rectilinear shape. However, it is appreciated that various other

shapes may be suitable for the intended purpose without exceeding the scope of the invention.

The planar surface 12 includes a nut base 14 formed central thereto that is dimensioned to receive and retain a complementary fastener therein. The nut  
5 base 14 may be threaded, barded, or provide any other complementary engagement means for securing a conventional fastener.

At least two elongated guide arms 18 extend from and beneath an outside edge 16 of the planar surface 12. Each guide arm 18 includes a U-shaped free end 20 operative to guide the fastener mounting clip 10 into a  
10 bore hole formed in the sheet material. The free end 20 of each guide arm 18 may alternatively be formed into a V shape or truncated V shape or any other shape that would provide the benefit of minimizing the amount of insertion force required for installing the fastener mounting clip 10 into a rectangular aperture 32 formed in the sheet material. Preferably, the guide arms 18 are  
15 spaced apart at approximately 180 degrees in an opposing fashion. Although two guide arms 18 are preferable, the inventive fastener mounting clip 12 could be made operable with at least one guide arm 18.

At least two resilient retaining arms 22 are also formed on the outside edge 16 of the planar surface 12. The retaining arms 22 extend beneath the  
20 planar surface 12 similar to the guide arms 18. Preferably, the retaining arms 22 include a top end 24 and a bottom end 26 which are essentially the extreme ends of the retaining arms 22 that are preferably formed to resemble elongated loops. The retaining arms 22 are operative to compress and expand upon

insertion of the fastener mounting clip 10 into the aperture 32 formed in the sheet material wherein the top ends 24 of the retaining arms 22 abut against a bottom surface of the sheet material when the fastener mounting clip 10 is fully inserted into the aperture 32. The top ends 24 of the retaining arms extend  
5 along under a perimetral edge 38 of the aperture between corners 36 of the aperture 32. The corners of the aperture are more resistant to bending than the perimetral edge between corners 38. Thus, when the clip is subjected to an extraction force, engagement of the corners provides high resistance to extraction forces.

10 As best shown in Figures 1 and 2, the retaining arms 22 through an aperture 42 and over an inner portion 44 in an inverted U shape. The keeper 40 holds the retaining arms 22 and the top keeper arm extends from ends 24 from outward deformation to resist extraction and deformation against extraction forces.

15 The bottom end 26 of the retaining arms 22 are shrouded by a complimentary recess 46 formed in the U-shaped free ends 20 of the guide arms 18. The recess 46 protects the retaining arms 22 of the fastener mounting clip against deformation by insertion forces acting on the bottom end 26 during insertion and supports the retaining arms against the sheet metal to resist  
20 extractions. It is appreciated that although the preferred embodiment employs two retaining arms 22, the inventive fastener mounting clip 10 could be made operative with at least one retaining arm. The retaining arms 22 are preferably

arranged in opposing fashion and complementary to the guide arms 18 such that the retaining arms 22 also stand substantially 180 degrees apart.

At least two support tabs 30 extend outwardly from the outside edge 16 of the planar surface 12. Preferably, the tabs 30 are arranged in an opposing fashion such that they extend outwardly from the planar surface 12 at substantially 180 degrees. The support tabs 30 are operative to abut against a top surface of the sheet material when the fastener mounting clip 10 is fully inserted into the aperture 32 formed in the sheet material. As such, the fastener mounting clip 10 is securely retained in the bore hole formed in the sheet material wherein the top ends 24 of the retaining arms 22 abut against the bottom surface of the sheet material adjacent the corners and wherein the support tabs 30 abut against the top surface of the sheet material. In this fashion, the fastener has high resistance to extraction forces mounting clip 10 forces. The tabs also serve to stabilize the fastener mounting clip 10 within the bore hole.

It is appreciated that the fastener mounting clip 10 includes a spaced distance D between the support tabs 30 and the top ends 24 of the retaining arms 22 wherein the distance D approximates the thickness of the sheet material for which the fastener mounting clip 10 is to be used. This distance D and the resiliency of the support tabs 30 are operative to compensate for surface inconsistencies as well as to ensure that the sheet material will be snugly sandwiched between the top ends 24 of the retaining arms 22 and the



support tabs 30 after the fastener mounting clip 10 has been inserted into the aperture.

Referring now to Figures 3 and 4, the side views of the fastener mounting clip 10 illustrate the retaining arms 22 and guide arms 18, respectively, extending beneath the planar surface 12 at obtuse angles. Preferably, the obtuse angles range between 90 and 120 degrees. Most preferably, the angles range between 95 and 105 degrees. It is appreciated that other angles that exceed these ranges may be suitable, however, without exceeding the scope of the invention.

Figures 5-8A illustrate a fastener mounting clip assembly 10' as a first alternative preferred embodiment to the above fastener mounting clip 10 that is formed of sheet material. A thread fastener may be inserted into the clip before installing the clip 10' into the aperture 32. As shown best in Figure 8A, wedge portions 60 are formed to engage an underside 37 of the sheet metal 31 about the corners 36 of the aperture 32.

As best illustrated in Figure 5, the fastener mounting clip assembly 10' includes a U-shaped retainer portion 50 and a U-shaped carrier portion 64. The U-shaped retainer portion 50 includes a U-base 52 having an aperture 54 formed at its center. Extending upwardly from the U-base 52 are opposing spring arms 56. Each spring arm 56 includes a U-shaped notch 58 formed between two retaining wedges 60 that extend along the outer edges of the spring arms 56. Each of the retaining wedges 60 has a tapered end adjacent to the U-base 52. The U-base 52 of the U-shaped retainer portion 50 preferably

includes at least one tab 80 disposed adjacent the aperture 54 formed therein for the purpose to be described hereinafter.

The U-shaped carrier portion 64 is dimensioned to engage the U-shaped retainer portion 50 in a complementary fashion wherein the U-base 52 of the  
5 U-shaped retainer portion 50 seats within the carrier base portion 66 of the U-shaped carrier portion 64.

Extending upwardly from the carrier base 66 is a protruding cylindrical nut base 68 formed central thereto. The cylindrical nut base 68 is dimensioned to be received through the aperture 54 formed in the U-base 52 of the U-shaped  
10 retainer portion 50. The protruding cylindrical nut base 68 has a threaded bore operative to receive and retain a fastener in complementary therein.

As described above, at least one tab 80 is disposed at the center aperture 54 of the U-base 52 of the U-shaped retainer portion 50 to lock the carrier 54 portion to the retainer portion 50. The stabilizer tabs 80 are operative to retain  
15 and stabilize the protruding cylindrical aperture 68 of the U-shaped carrier portion 64 upon assembly of the fastener mounting clip assembly 10' as according to the invention.

The U-shaped carrier portion 64 includes opposing inverted L-shaped arms 70 having a body portion 72 and a base portion 74. The body portion 72  
20 of the opposing inverted L-shaped arms 70 extends upwardly from the carrier base 66 while the base portions 74 extend outwardly from the carrier base 66 in a winged fashion.

The body portion 72 of the inverted L-shaped arms 70 each include bilateral notches 76 such that the body portion 72 appears to have an I-beam shape. The bilateral notches 76 are dimensioned to interlockingly engage the retaining wedges 60 of the spring arms 56 after assembly. In this manner, the  
5 U-shaped retainer portion 50 and the U-shaped carrier portion 64 form the fastener mounting clip assembly 10' as according to the invention.

As shown in Figure 8A, the fastener mounting clip assembly 10' is dimensioned to be received in the aperture 32 formed in the sheet material such that the retaining wedges 60 compress to permit insertion then deform  
10 outwardly to abut against a bottom surface of the sheet material. The wedges 60 have a curved top edge 82 which extends about the corners 36 of the aperture 32 when the fastener mounting clip assembly 10' is properly seated within the aperture 32.

Additionally, the base portion 74 of the inverted L-shaped arms 70  
15 abuts against a top surface 39 of the sheet material after proper insertion of the fastener mounting clip assembly 10' as according to the invention. It is appreciated that a distance D' exists between the top surface of the retaining wedges 60 and the base portion 74 of the inverted L-shaped arms 70 such that the sheet material having a thickness approximately equal to the distance D'  
20 may be snugly positioned therebetween. The resiliency of the base portion 74 of the inverted L-shaped arms 70 allows for inconsistencies in the thickness of sheet materials for which the fastener mounting clip assembly 10' is to be used.

Preferably, the fastener mounting clip assembly 10' is formed of spring steel, aluminum or copper. However, it is appreciated that other materials such as resiliently rigid plastic materials may be constructed and made suitable for the intended purpose as according to the invention.

5           As best shown in Figures 9-11, a second alternative preferred embodiment of the invention includes a retaining mounting clip assembly 110 formed similarly to the first alternative preferred embodiment fastener mounting clip assembly 10'. As best shown in Figures 10 and 11, the mounting clip assembly 110 has a retainer 150 and a carrier 164. The retainer is similar  
10       to the retainer portion 50 of the first alternative embodiment but has wedges 160 which have a somewhat greater flare than the wedges 60 of the first alternative preferred embodiment.

As shown in Figures 10 and 11, the carrier 164 has an opposed pair of arms 170 and an opposed pair of walls 168 which extend from a base portion  
15       166. The arms 170 have a lower angled portion 172, a center portion 174 and an L-shaped upper portion 176 which engage the upper surface of the sheet metal as above. A nut base 164 is formed on the center portion 174 and extends through a through bore in the carrier 164. The walls 168 have a lower angled portion 182 and an upper portion 184 with bilateral gaps 186 formed to  
20       receive the wedges 160 as above. The center portions 174 of the arms 170 and the upper portions 184 of the walls 168 abut against the edges of the aperture 32 to locate the clip assembly 110. The lower portions 172 of the arms and the lower portions of walls 168 of the walls 172 of the carrier 164 angle outwardly

and upwardly guide the clip assembly 110 during insertion of the clip in the aperture 32. The carrier 164 is mounted to the retainer 150 in the same fashion as before except that the wedges 160 extend through the gaps 186 in the wall 168. Installation and operation of the clip assembly 110 are just as described  
5 above for the first alternative preferred embodiment of the invention.

A third preferred embodiment of a mounting clip 210 is shown in Figures 12-15. Like the preceding embodiments, the mounting clip 210 is formed of two pieces, namely a carrier 264 and a retainer 250. As shown in Figure 13, the retainer 250 has a generally rectangular lower center portion 252  
10 with an aperture 254 for receiving the nut base 68 of the carrier 264. A pair of retaining arms 222 extend upwardly from opposed sides of the center portion 252. L-shaped upper portions 256 of the arms engage the upper surface 39 of the sheet metal as above (Figure 15). A pair of side walls 258 extend upwardly from an other pair of opposed sides of the center portion 252. Each side wall  
15 258 has a center upright portion 260 extending between a pair of wedges 262 which engage the lower surface 37 of the sheet metal as before.

As shown in Figures 13 and 15, the carrier member 264 includes a rectangular center portion 266 with the nut base 68, a pair of guide arms 268 and a pair of upper arms 270. The guide arms 268 extend downwardly at an  
20 angle from opposed sides of the center portion 266. The guide arms form a truncated V to guide the retaining clip 210 into the aperture. The pair of upper arms 270 extend from the other pair of opposed sides of the center portion 266. The upper arms are L-shaped and have a distal portion 272 which contact the

upper portion of the aperture. The lower portions of the locking arms 270 are spaced apart a distance equal to the width of the aperture to position the clip 210 in the aperture.

As shown in Figure 14, the retainer 250 is received between the arms of  
5 the carrier 264 with the nut base 68 extending up through the aperture 254.  
When inserted into the sheet metal, portions of the arms of the retainer 250 and the carrier 264 extend outwardly to contact the upper portion of the sheet metal. The wedges 268 of the retainer snap outwardly after insertion to hold the clip 210 against the lower surface at the corners of the sheet metal. The  
10 wedges 68 and arms 222, 270 of the retainer and carrier hold the clip 210 from displacement from the aperture.

From the foregoing it can be seen that the above embodiments provide a fastener mounting clip for use in securing a fastener in a bore hole formed in sheet material or a body formed thereof. Having described the invention,  
15 however, many modifications thereto may become apparent to those skilled in the art to which it pertains without deviation from the spirit of the invention as defined by the scope of the appended claims.

We claim: